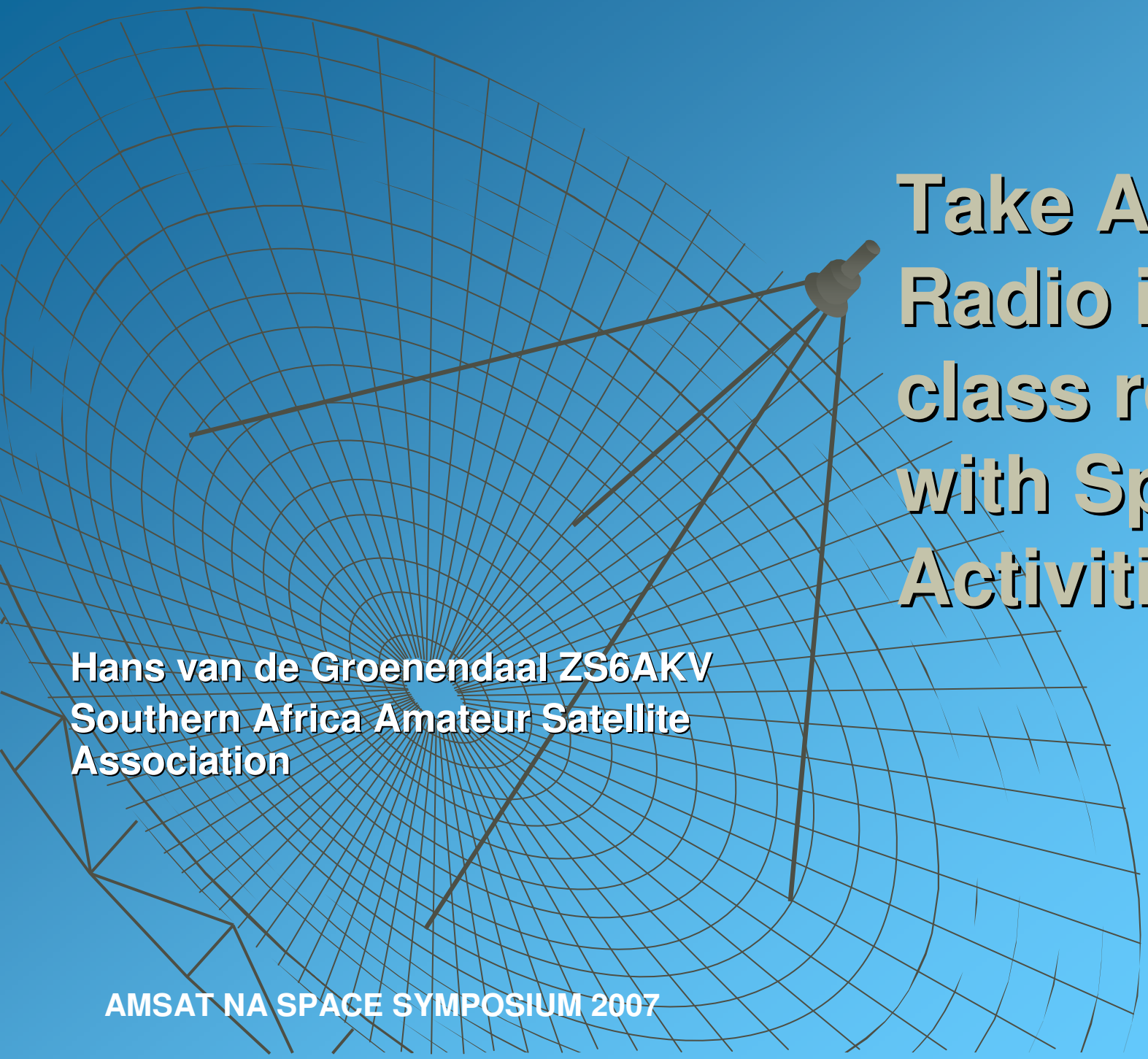


Take Amateur Radio into the class room with Space Activities

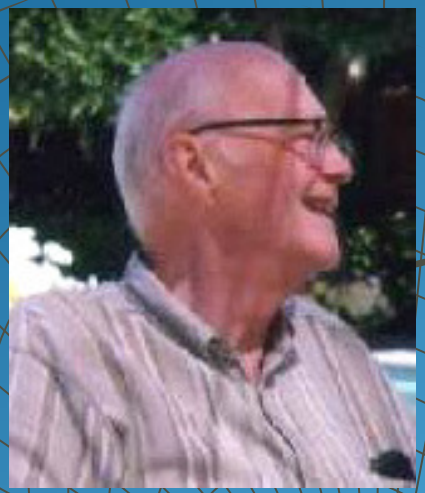
Hans van de Groenendaal ZS6AKV
Southern Africa Amateur Satellite Association

AMSAT NA SPACE SYMPOSIUM 2007

Easier said than done!

- The computer keyboard, the cell phone key pad are real opposition to amateur radio
- Amateur Radio must come up with better ideas than ‘talk to the world for free’ –
- Skype does!
- We must make Amateur Radio cool!
- Space, satellite, man on the moon, ISS

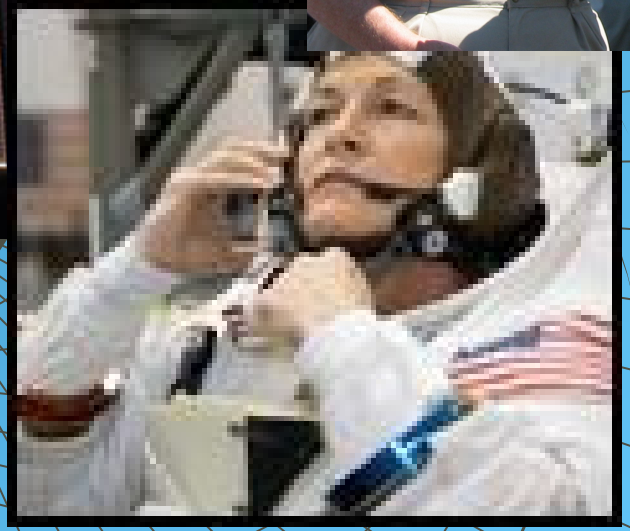
William Orr W6SAI



"The spirit of adventure lies buried in every man's soul."

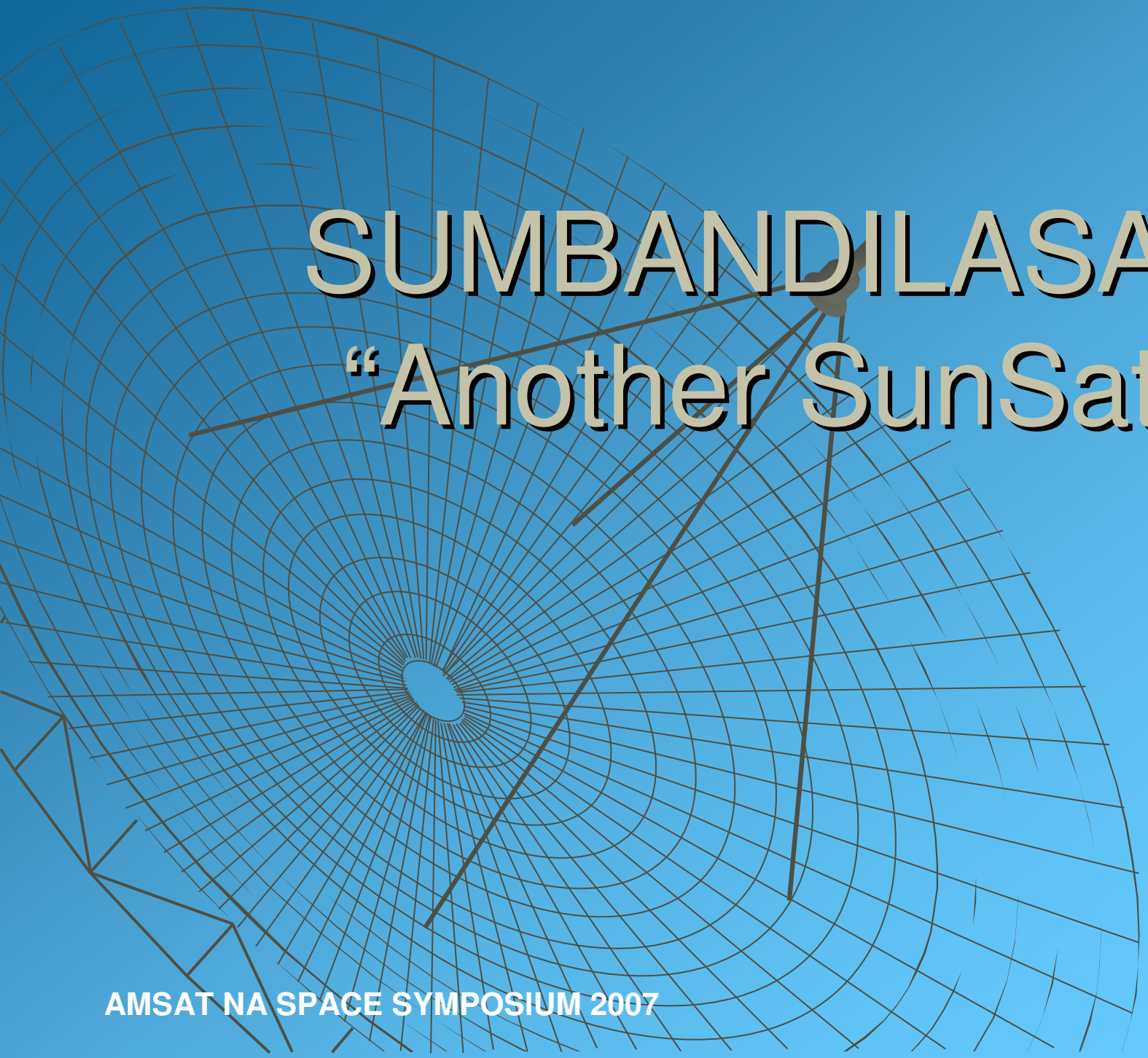
"Strike the spark and ignite the soul and the impossible is accomplished"

We have to strike the spark!



ARISS

SUMBANDILASAT
"Another SunSat"



AMSAT NA SPACE SYMPOSIUM 2007

Take a step back

SumbandilaSat

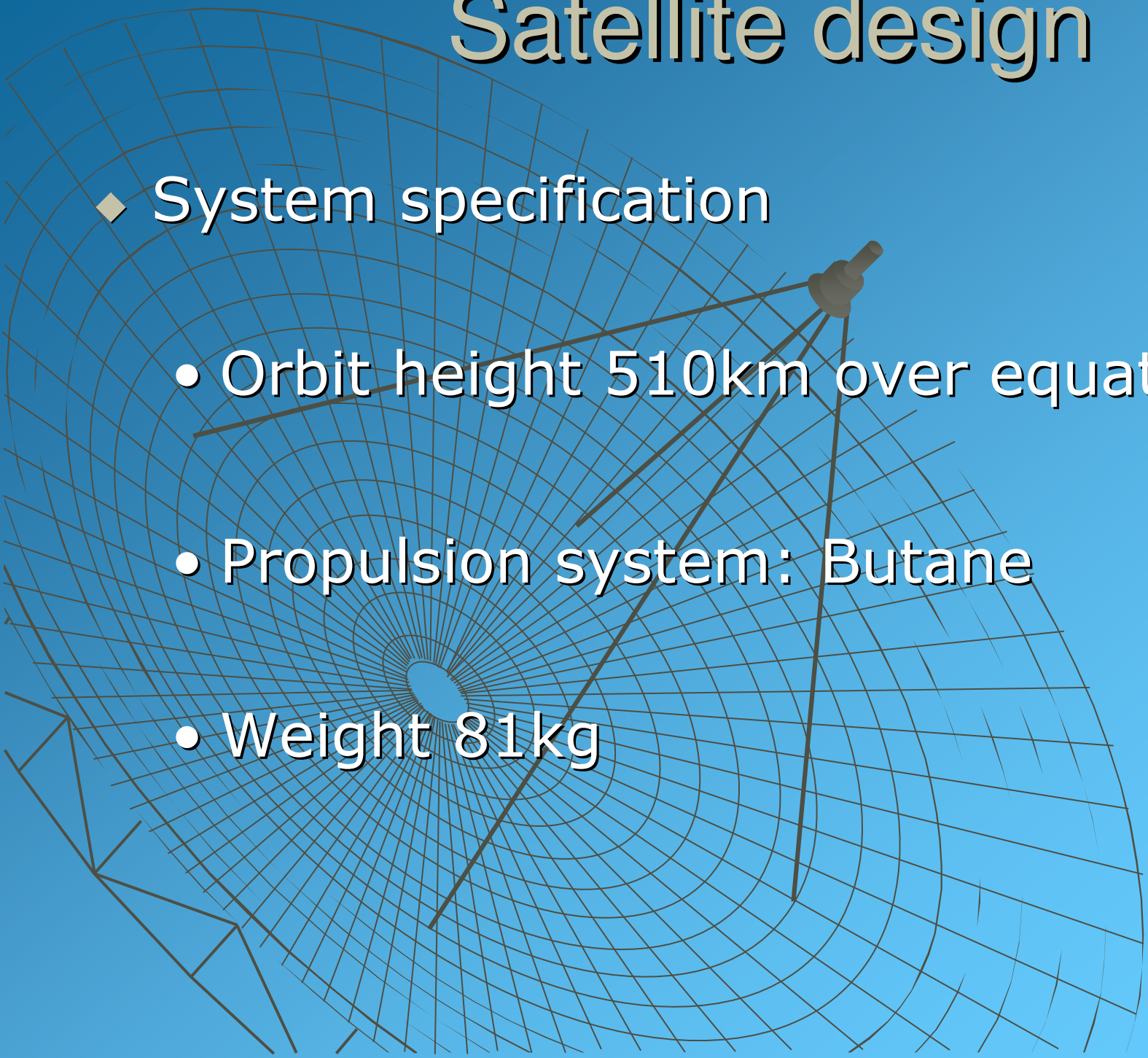
- SumbandilaSat is a LEO satellite
- Main payload is a remote sensing camera
- Secondary payload is a telecommunications system sponsored by the Department of Communication
- The other missions are the experimental payloads

SAT
SUMBANDILA

Mission Objectives

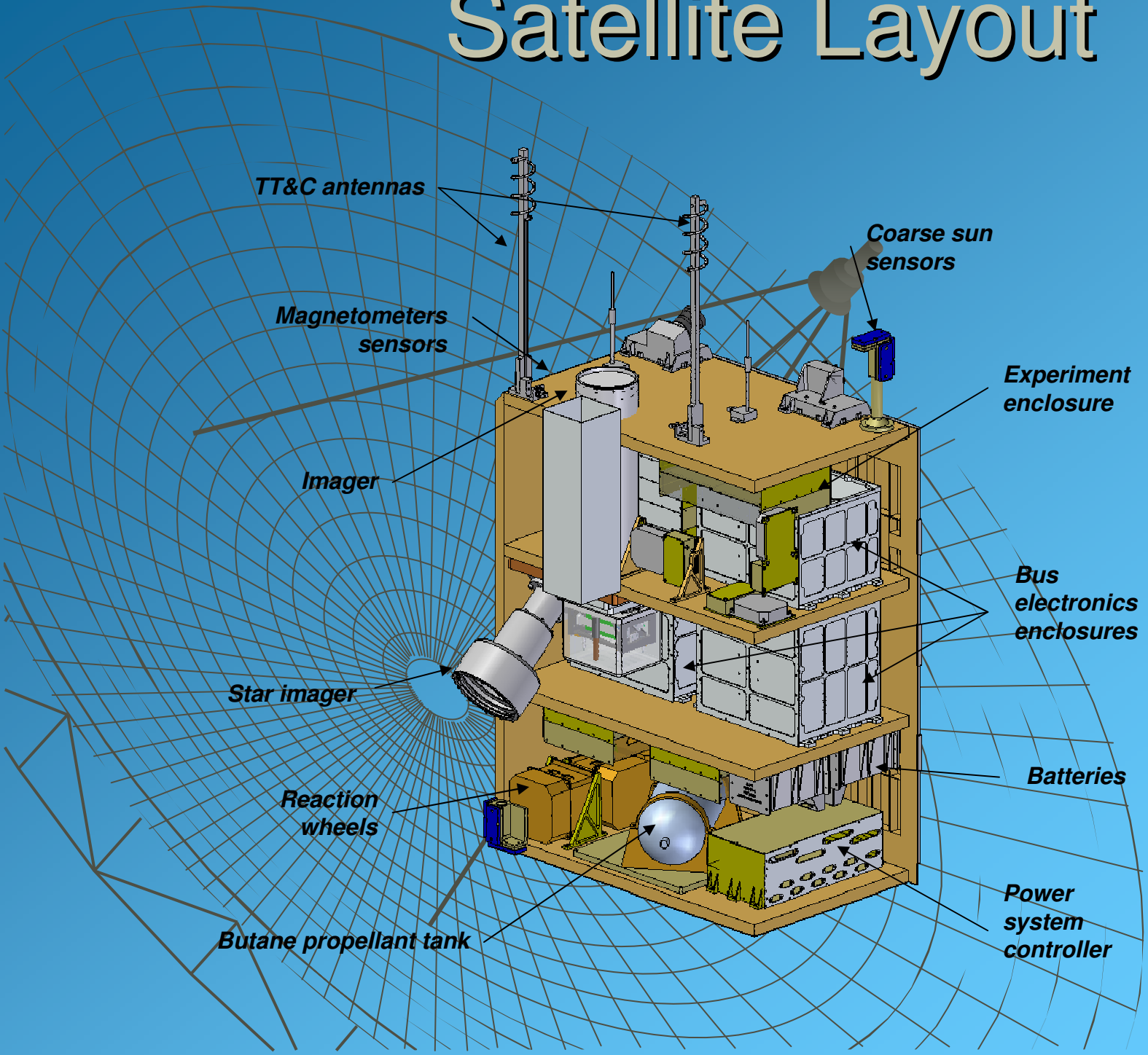
- The development and growth of people and institutions
- Providing satellite data for applications addressing the needs of society
- Understanding the modalities of a small satellite programme in order to inform the space policy process in South Africa

Satellite design

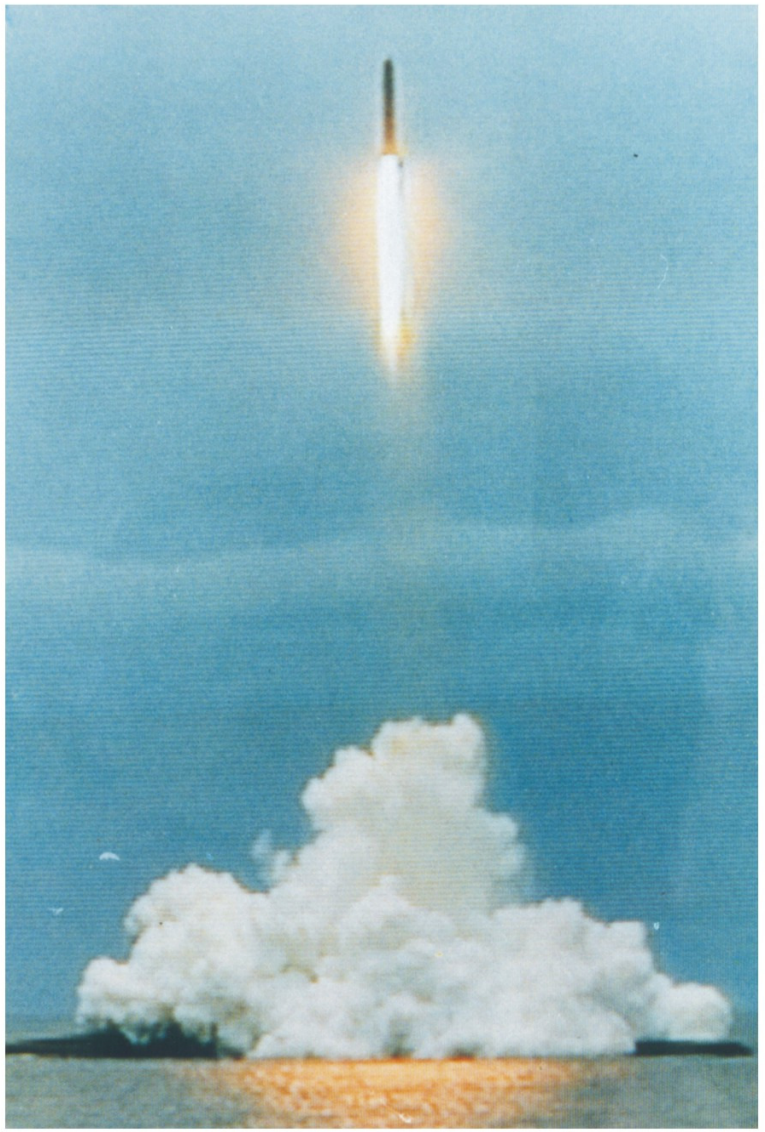


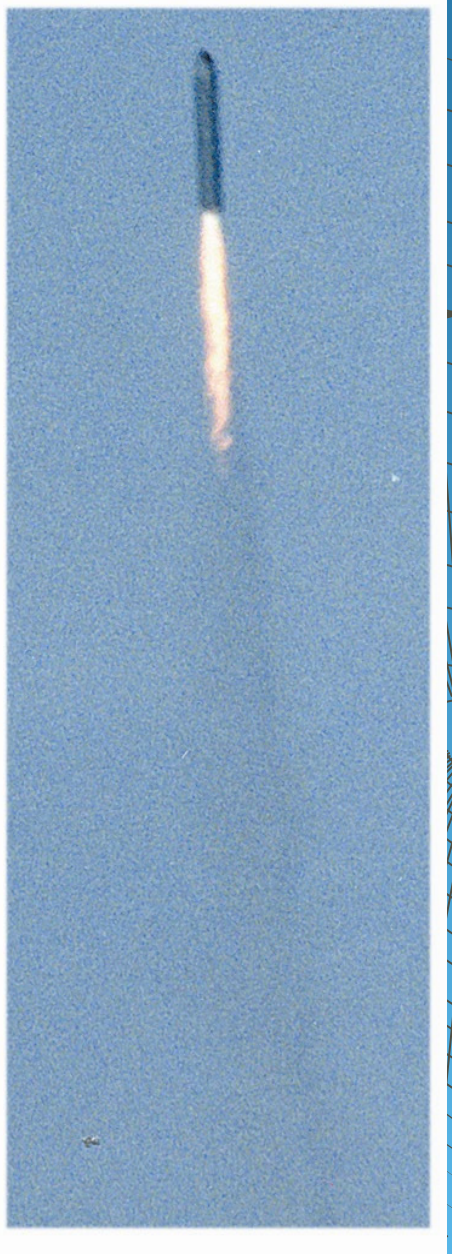
- System specification
  - Orbit height 510km over equator
  - Propulsion system: Butane
  - Weight 81kg

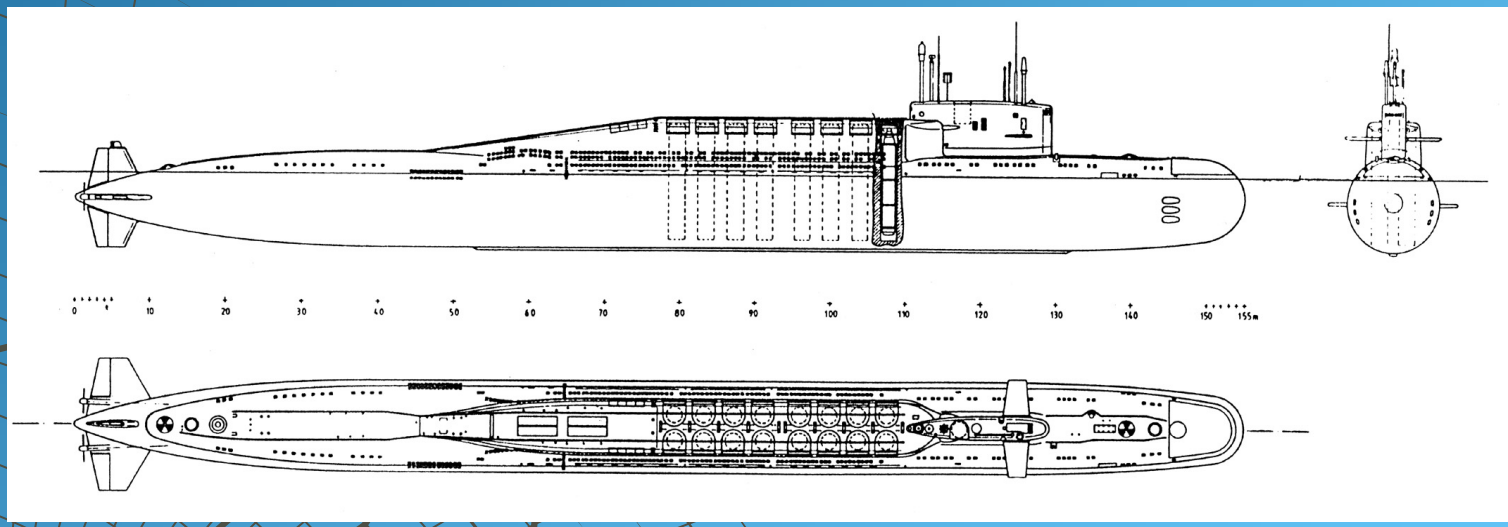
Satellite Layout



Planned Shtil 2.1 Launch






0
10
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120
130
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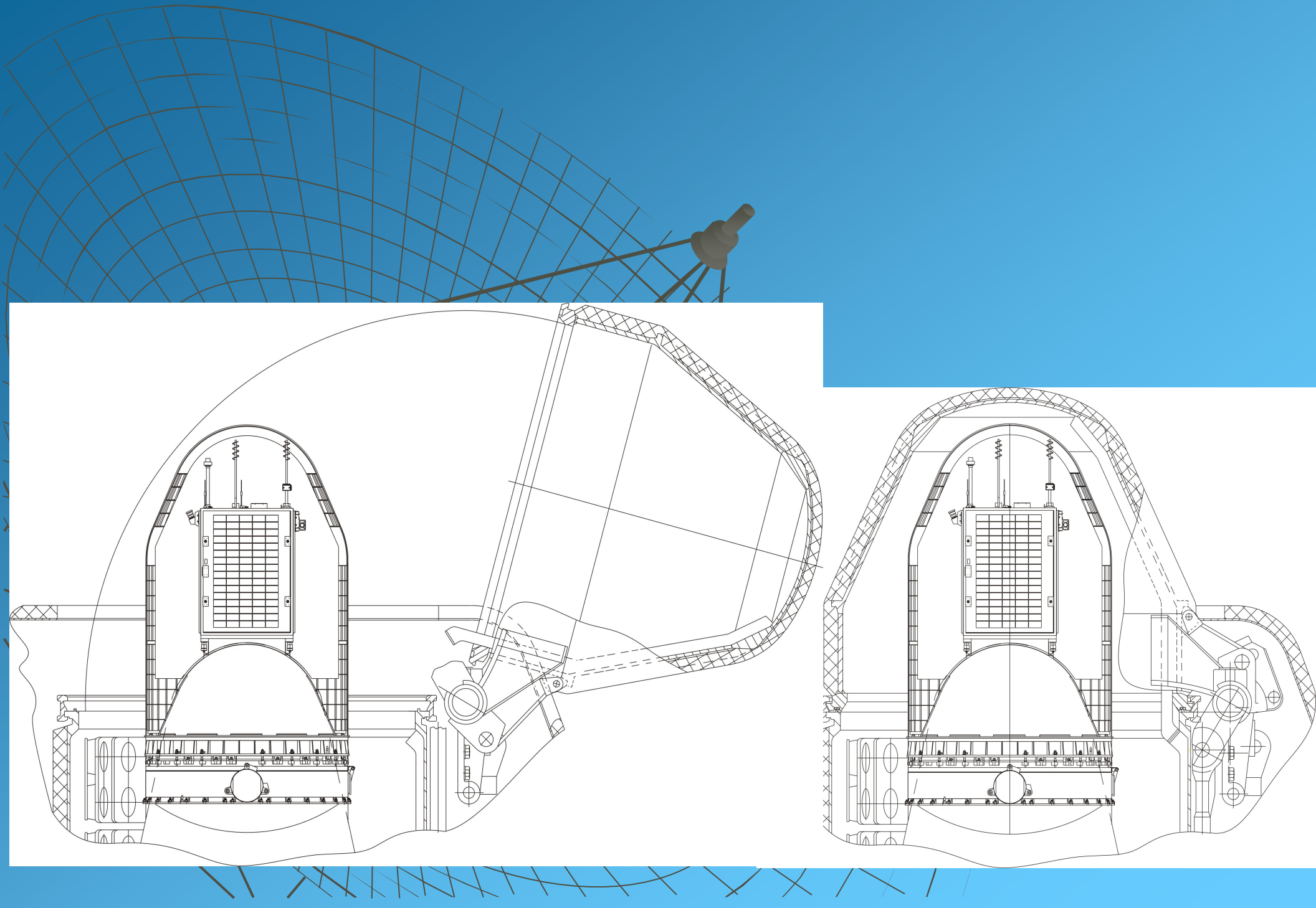
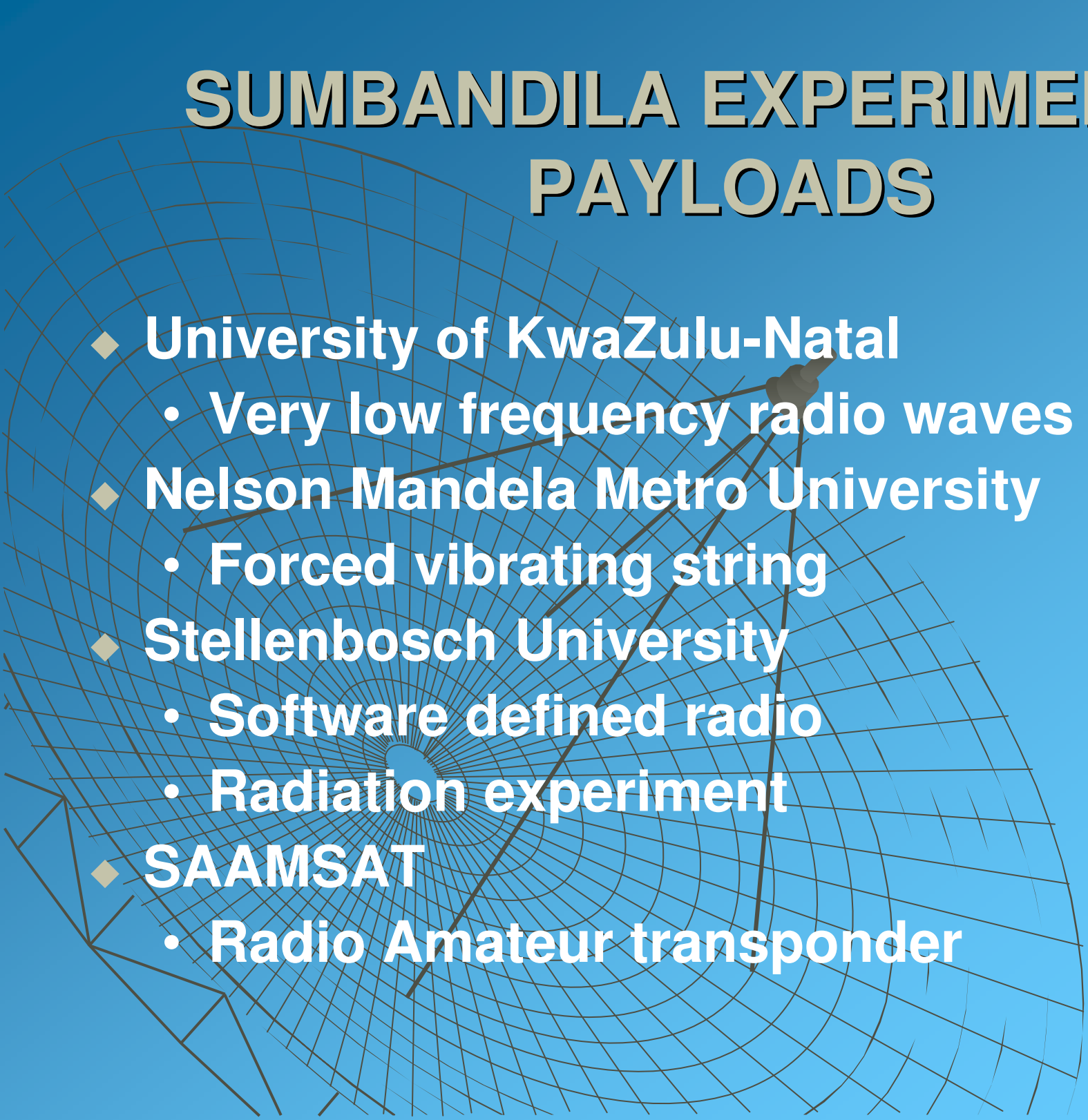
150
155 m

THE LAUNCH OF THE “SHTIL” LV



SUMBANDILA EXPERIMENTAL PAYLOADS



- University of KwaZulu-Natal
  - Very low frequency radio waves
- Nelson Mandela Metro University
  - Forced vibrating string
- Stellenbosch University
  - Software defined radio
  - Radiation experiment
- SAAMSAT
  - Radio Amateur transponder

Nelson Mandela Metropolitan University

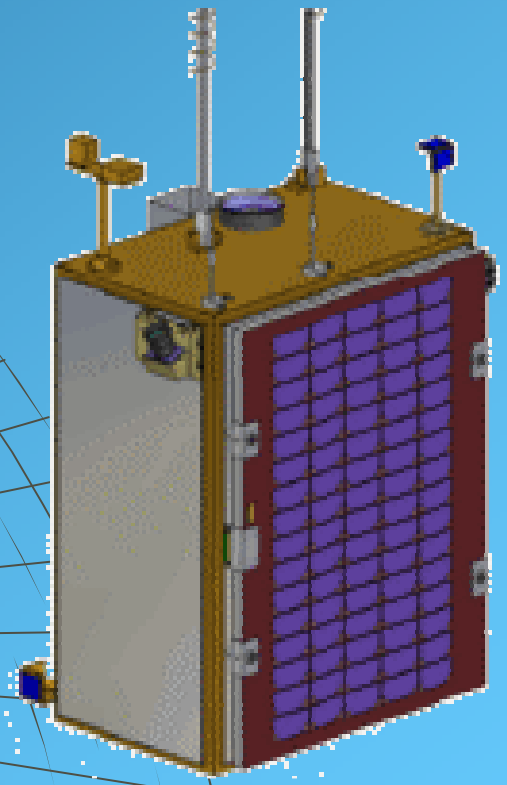
Forced vibrating string

- First micro gravity experiment on a SA satellite
- Comparison of vibration of a string in microgravity to line vibration of overhead telecommunication and power systems.
- In space the true vibration can be measured without having the dampening effect of air around
- The information will be useful in the study of overhead line behaviour and how to shorten spans.
- The University of Stellenbosch as devised a unique way of measuring the vibration of the string in all directions as well as the lengthening of the string. They call it their violin project

SA AMSAT Payload

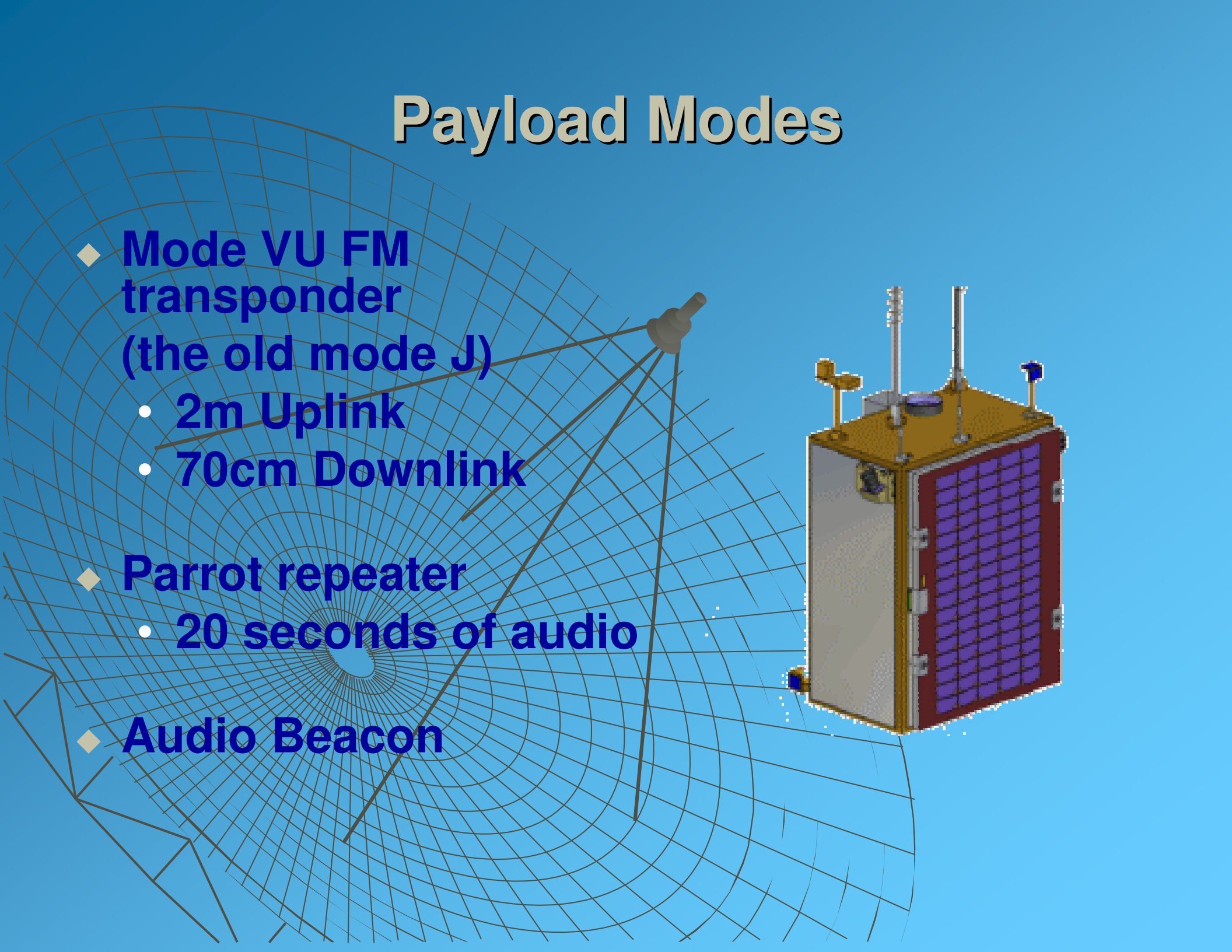
Objectives

- To promote an interest in SET amongst young people through their hands on involvement
- Create interest in satellite communication amongst the general amateur population

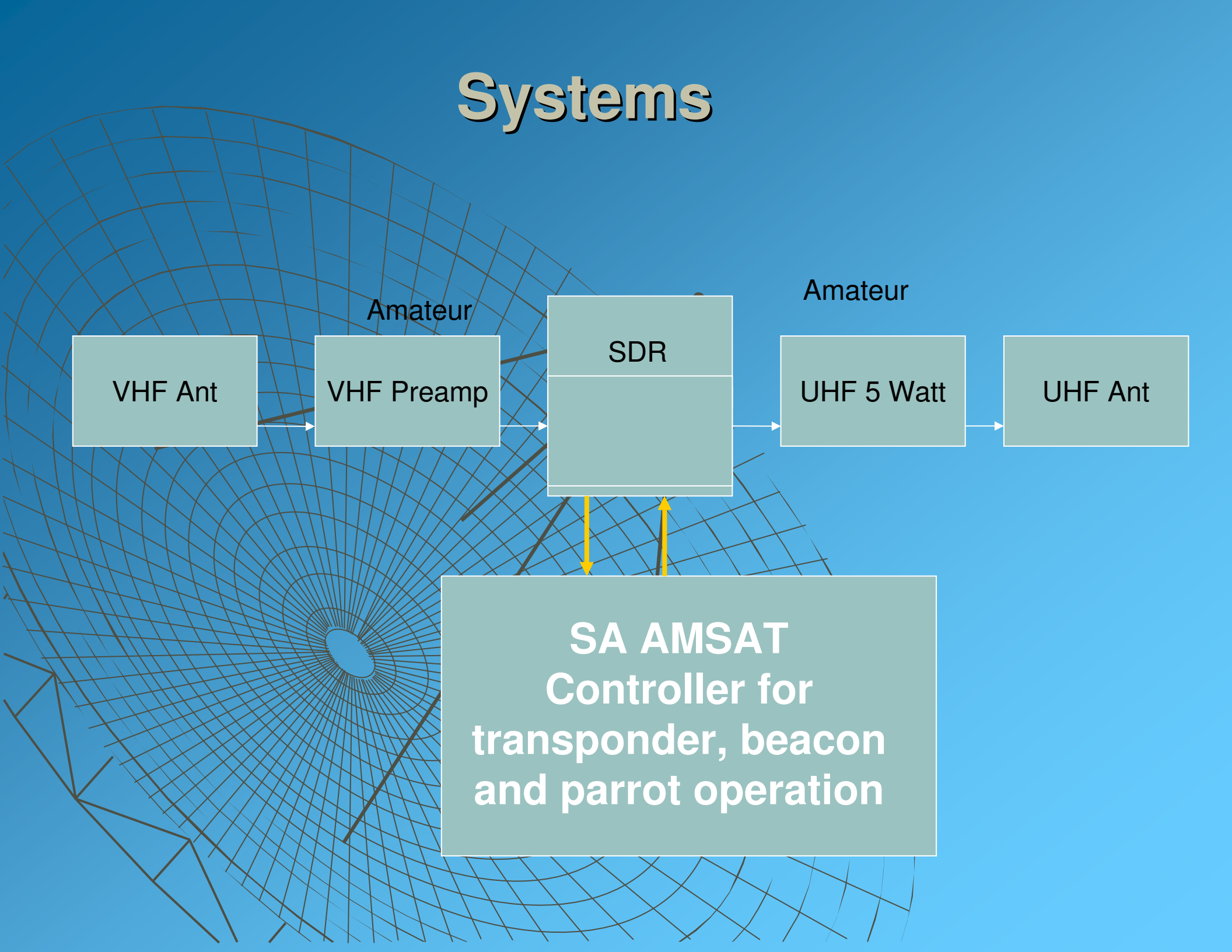


Payload Modes

- Mode VU FM transponder (the old mode J)
  - 2m Uplink
  - 70cm Downlink
- Parrot repeater
  - 20 seconds of audio
- Audio Beacon

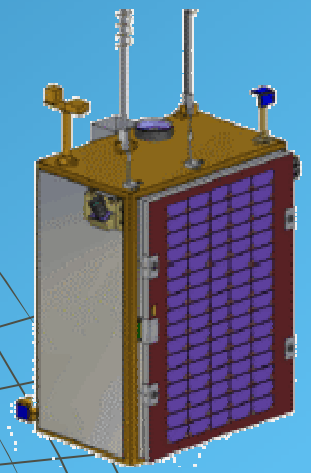


Systems


Amateur
Amateur
VHF Ant
VHF Preamp
SDR
UHF 5 Watt
UHF Ant
SA AMSAT
Controller for
transponder, beacon
and parrot operation

Operation

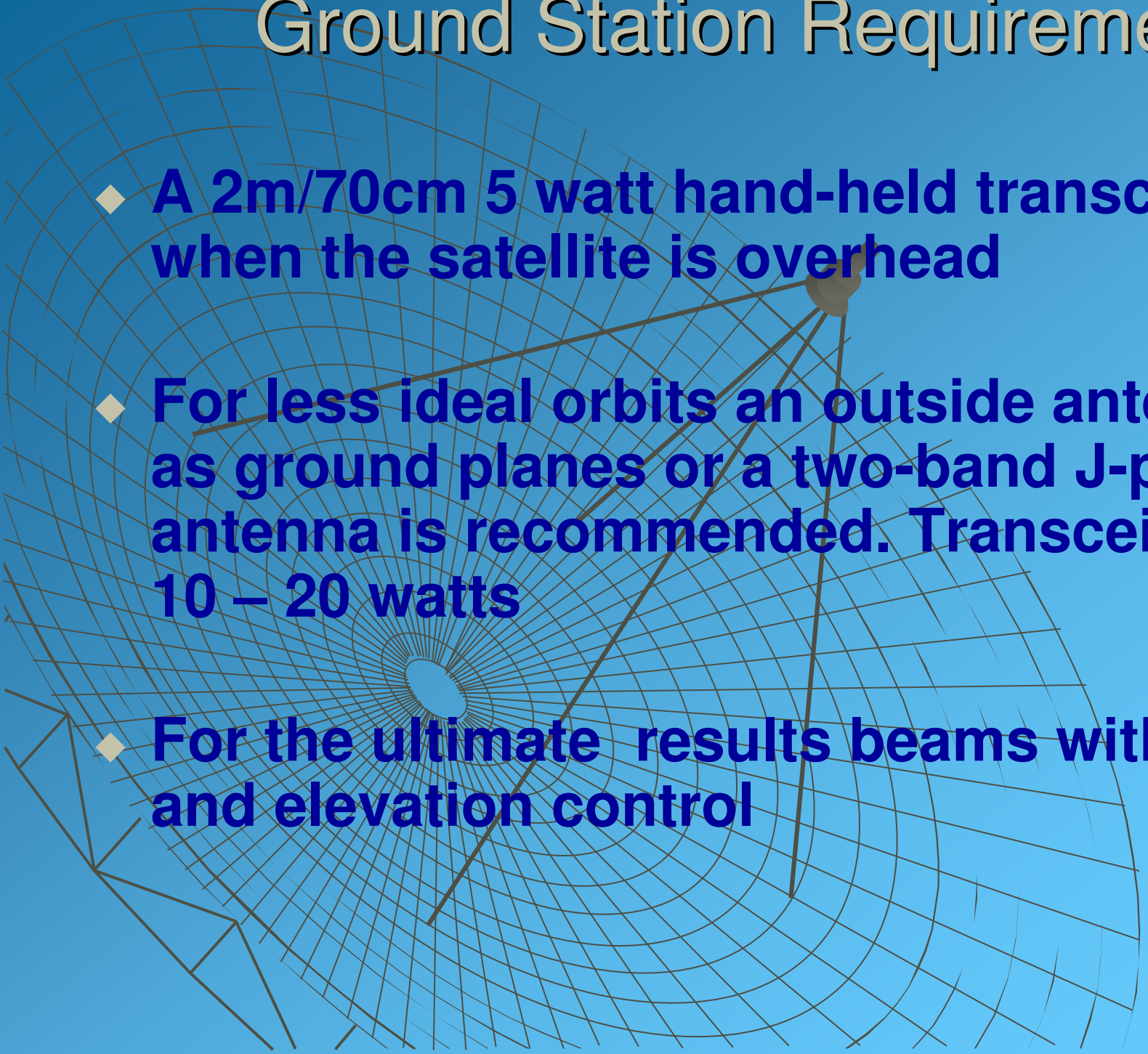
- On receipt of a “X” CTCSS tone the unit will command the satellite in the transponder mode
- On receipt of a “Y” CTCSS tone the control unit will command the satellite in the parrot mode
- If for a period no tones are received, the system will activate a voice beacon



Constructing Prototype

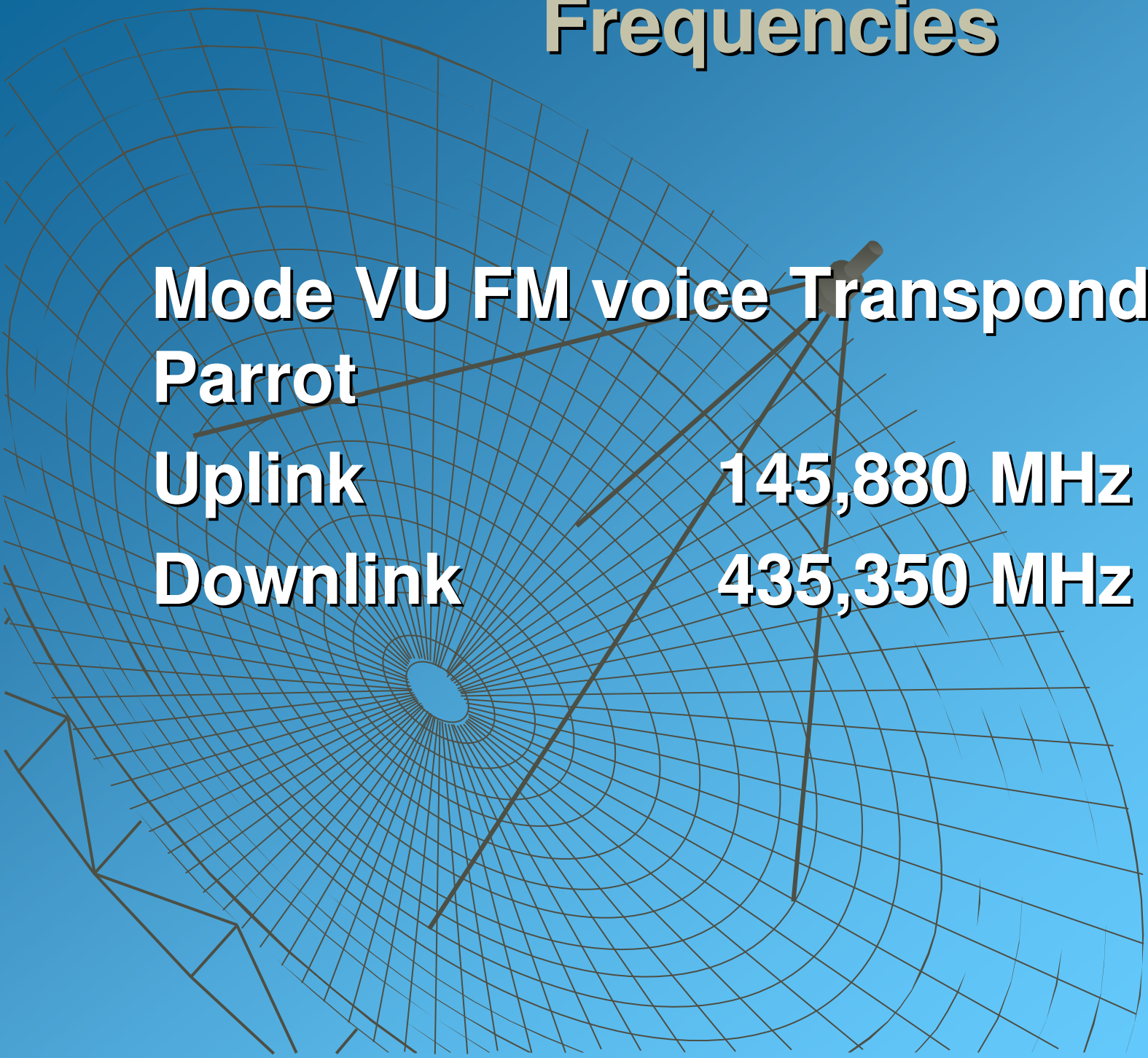
- Design: Andrew Roos ZS6AAA
- Prototyping: Hannes Coetzee ZS6BZP

Ground Station Requirements



- **A 2m/70cm 5 watt hand-held transceiver when the satellite is overhead**
- **For less ideal orbits an outside antenna such as ground planes or a two-band J-pole antenna is recommended. Transceiver power 10 – 20 watts**
- **For the ultimate results beams with azimuth and elevation control**

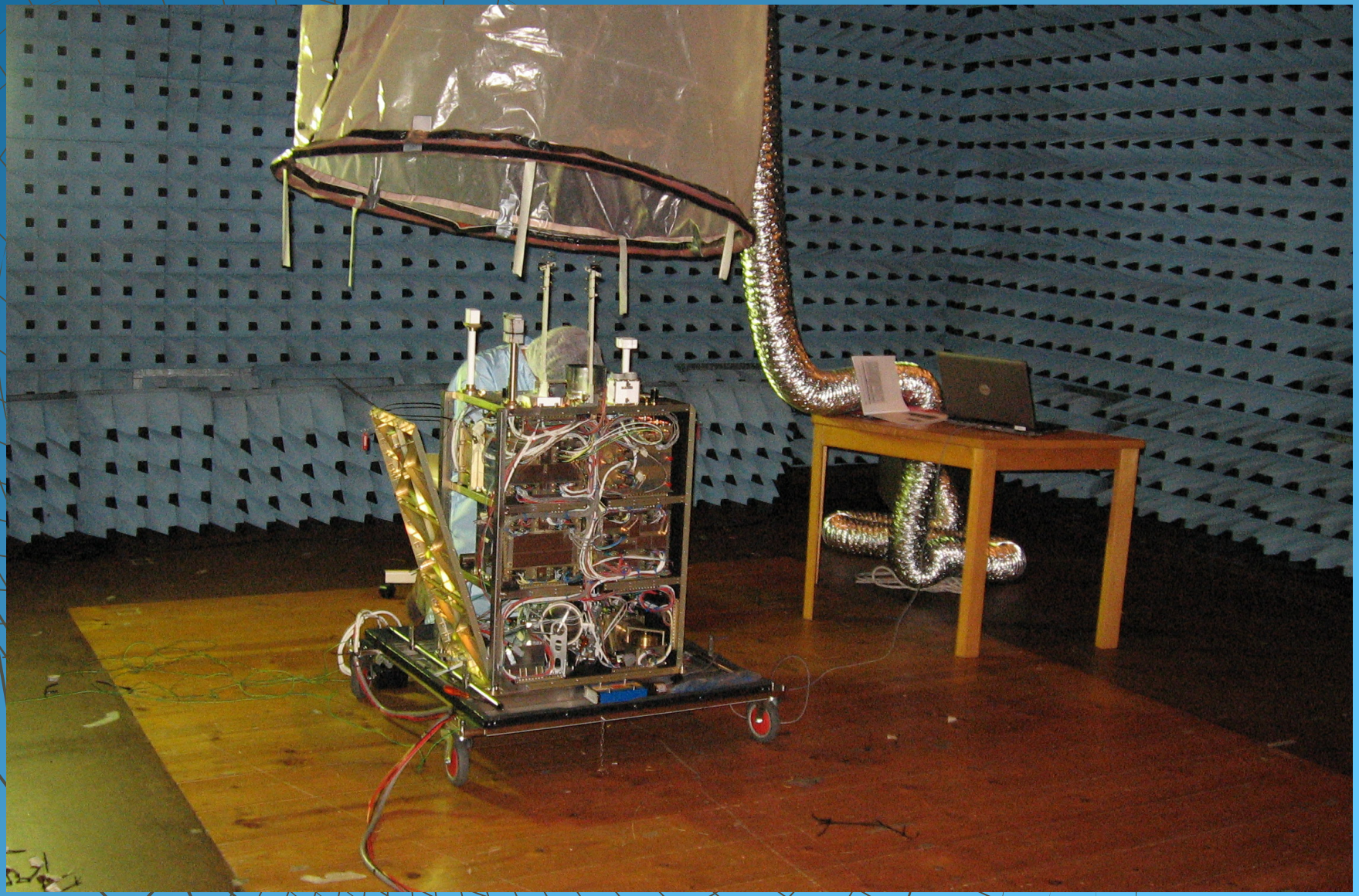
Frequencies



Mode VU FM voice Transponder and Parrot

Uplink	**145,880 MHz**
Downlink	**435,350 MHz**

All Systems go



Ready in Clean room to go

BEACON

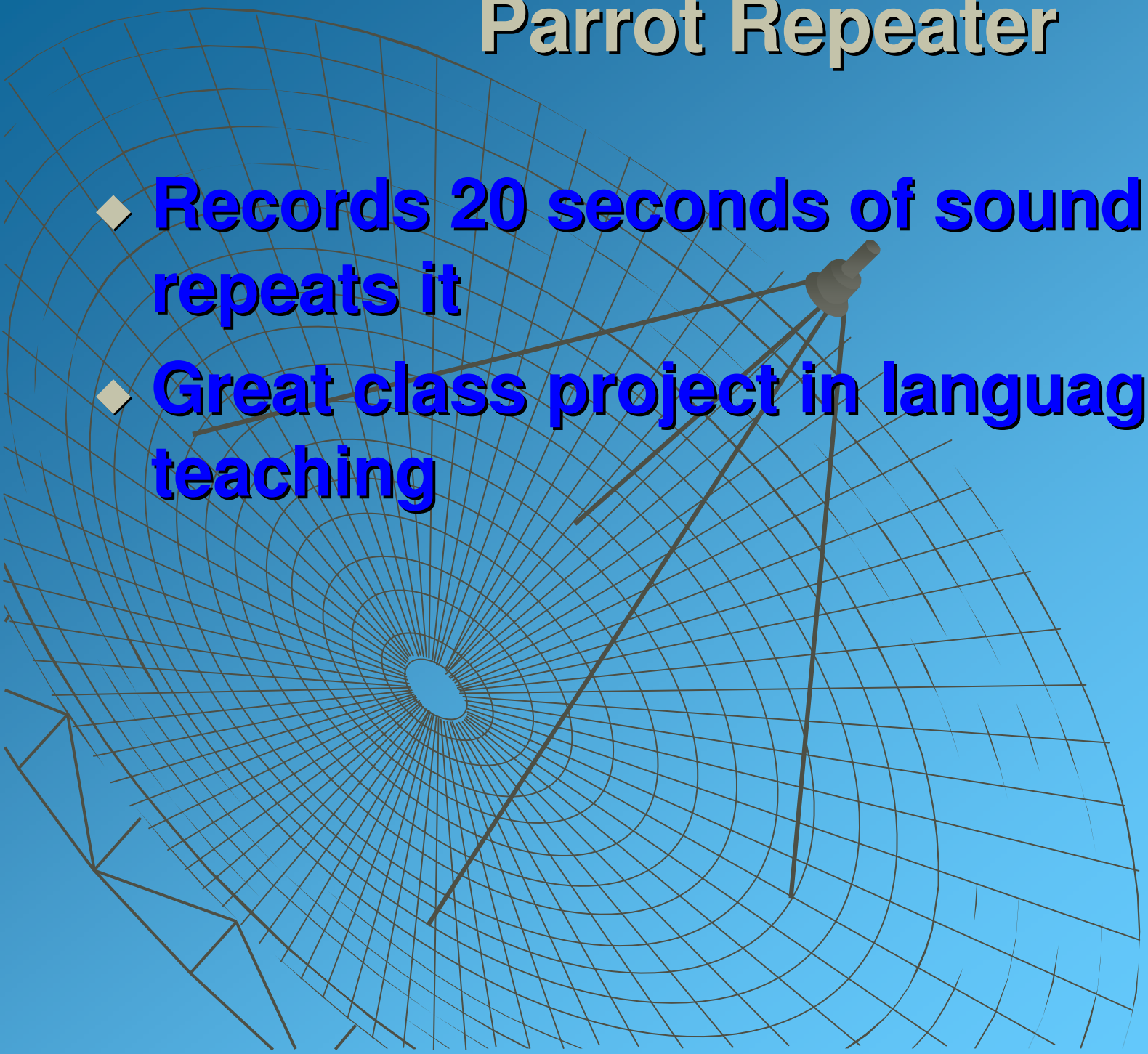
- The beacon message can be changed
- On launch there will be a pre-recorded beacon message
- The launch message was chosen from entries in a competition

Anton Coetzee

Kimberley Technical High School

Parrot Repeater

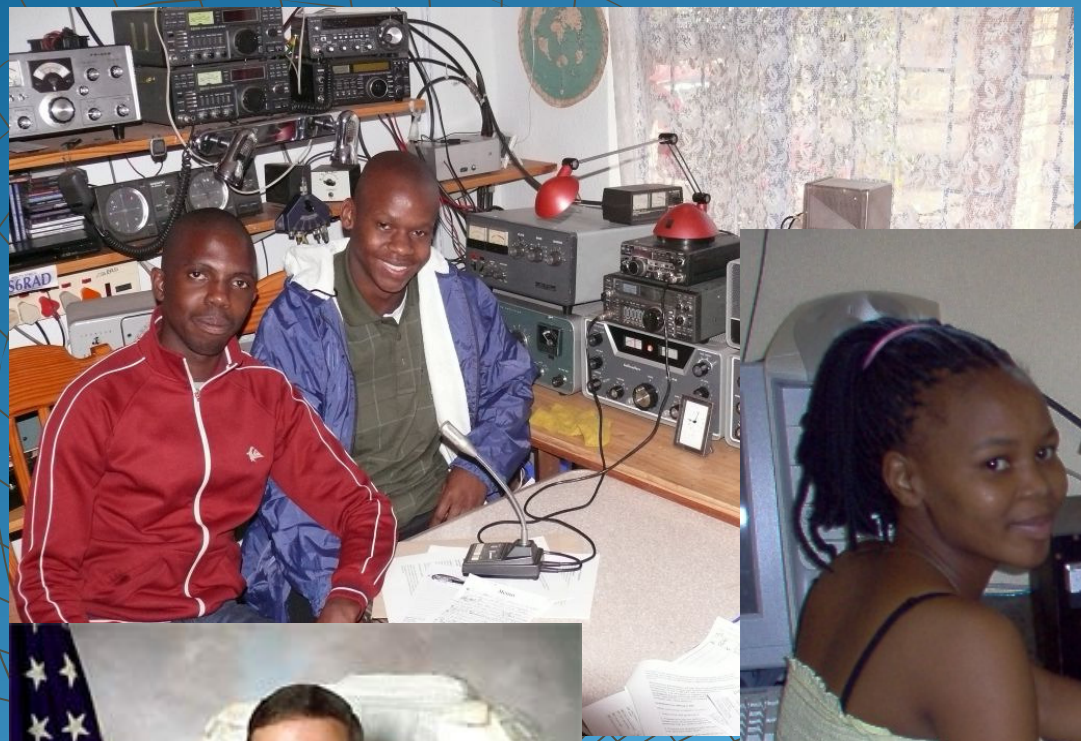
- Records 20 seconds of sound and repeats it
- Great class project in language teaching



Real Life Experience

- Taking satellites into the class room

Talking to an Astronaut



Will I ever get a chance to get into space?

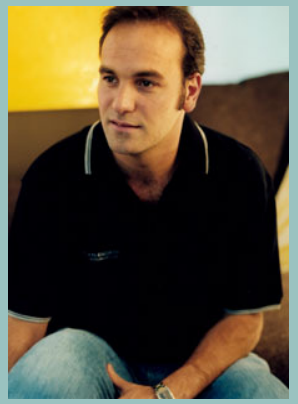
International Space Week

- Several schools were selected for the “Into Space with Amateur Radio Project" on 10 October
- Amateur Radio Stations are set up to connect learners to Mark Shuttleworth, Africa’s first astronaut

Space Essay Competition

- Learners were invited to write a 400 – 600 word essay on :“The future of Space in support of mankind”.
- Learners who entered the best essay will be chosen to talk with Mark Shuttleworth
- The best entry wins a laptop computer

Network



Mark in London

Conference Bridge

Control Station

REPEATERS

www.amsatsa.org.za

SA AMSAT is affiliated to the South African Radio League

The National Body for Amateur Radio in South Africa